REMARKS

In response to the above-identified Office Action, Applicants amend the application and seek reconsideration thereof. Claims 15-29 are pending.

Attached hereto is a marked-up version of the changes made to the specification by the current amendment. The attachment is captioned "Version With Markings To Show Changes Made."

I. Specification.

The Examiner objects to the Abstract of the Disclosure and the Summary of the Invention because the first sentence in each is not complete. Applicants have addressed this objection in the Substitute Specification. Accordingly, Applicants respectfully request that this objection be withdrawn.

The Examiner objects to the Disclosure since the status of applications referred to therein needs to be updated. Applicants have addressed this objection in the Substitute Specification. Accordingly, Applicants respectfully request that this objection be withdrawn.

The Examiner objects to the Disclosure since the Application that is claimed in the Specification to be included in Appendix I (i.e., 08/829,857) is missing from the Specification. Applicants have addressed this objection in the Substitute Specification. Accordingly, Applicants respectfully request that this objection be withdrawn.

II. Claims Rejected Under 35 U.S.C. § 112, First Paragraph

The Examiner objects to Claims 20-24 under 35 U.S.C. § 112, first paragraph, as containing subject matter which is not described in the Specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the

Application was filed, had possession of the claimed invention. The Examiner argues that the Specification does not describe a machine-readable medium containing instructions, which, when executed by a processor, cause an internal packet switched data network to be configured as recited in Claim 20. Applicants have amended Claims 20-24 to address this rejection. Accordingly, Applicants respectfully request withdrawal of the rejection to Claims 20-24.

III. Claims Rejected Under 35 U.S.C. § 112, Second Paragraph

The Examiner rejects claims 15-19 and 25-29 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. In particular, the Examiner argues that it is unclear in claims 15 and 25 whether each outbound resource can convert to only one of the listed formats or to any of the listed formats.

Among other limitations, independent claims 15 and 25 recite converting a request message into a format capable of being transmitted to one of a fax machine over a Generalized Switched Telephone Network ("GSTN"). A telephone over the GSTN, and a paging terminal over the GSTN or to a paging gateway over the external network packet switched network. Claims 15 and 25 use the phrase "one of" in an expression of the form *one of A, B, and C*. This expression as used in claims 15 and 25 means one or more of A, B, and C. Thus, each outbound resource can convert to one or more of the listed formats. The Examiner further argued that it is unclear whether each outbound resource can convert to a single format capable of being used by any type of GSTN or to any format that might be needed by a GSTN. Applicants respectfully traverse this rejection as to independent claims 15 and 25.

Among other limitations, independent claims 15 and 25 recite converting a request message into a format capable of being transmitted to one of a fax machine over a Generalized Switched Telephone Network ("GSTN"), a telephone over the GSTN, and a paging terminal over the GSTN. Applicants note that when speaking of something in general terms such as the GSTN, one is speaking of every member of a class or category. Thus, there is no "type" of GSTN since a GSTN embraces all types of switched telephone networks. Since an outbound resource is capable of converting a request message into a format capable of being transmitted over a GSTN, it follows that the message format can accommodate particular switched telephone networks encompassed by a GSTN.

Accordingly, Applicants respectfully request withdrawal of the rejection of independent claims 15 and 25. Claims 16-19 depend from claim 15. Claims 26-29 depend from claim 25. As such, the rejected dependent claims satisfy 35 U.S.C. § 112, second paragraph for at least the same reasons as their respective independent claims.

IV. Claims Rejected Under 35 U.S.C. § 103(a)

The Examiner rejects claims 15-19 and 25-29 under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 5,406,557 to Baudoin, et al. ("Baudoin"). Applicants respectfully traverse this rejection.

The Examiner's obligation in making a *prima facie* case of obviousness requires the Examiner to show that the prior art in combination teaches or suggests all elements of the claimed invention. Applicants respectfully submit that the Examiner has failed to set forth a *prima facie* case of obviousness.

Among other limitations, claims 15 and 25 each recite communicating with a plurality of outbound resources and a database server over an internal packet switched data network.

In making the rejection, the Examiner analogizes the e-mail hub external communication modules of Baudoin to the outbound resources of Applicants' claims. The Examiner further states that the database server of Applicants' claims is contained within the e-mail hub of Baudoin As a preliminary matter, Applicants note that a database server would not be contained within an e-mail hub. Database servers are stand-alone, dedicated software programs for providing efficient access to database resources. Situating a database server within an e-mail hub would defeat this purpose.

Even assuming for the sake of argument that the Examiner's analogy is correct, Baudoin does not teach or suggest an internal packet switched data network through which the external communication modules and the database server communicate. An external network keeps its packet traffic separate from traffic on an internal data network. Internal data networks are typically employed to prevent sensitive data from traveling over the external network and also to allow the internal data network to be configured differently from the external data network. In contrast, Baudoin discloses that the e-mail hub and its external communication modules use a message queue to communicate rather than a packet switched network. (Baudoin, col. 5, lines 49-59.) Thus, Baudoin neither teaches nor suggests communicating with every one of a plurality of outbound resources and the database server over an internal packet switched data network.

Accordingly, Applicants respectfully request withdrawal of independent claims 15 and 25. Claims 16-19 depend from claim 15. Claims 26-29 depend from claim 25. As

such, the rejected dependent claims are not obvious for at least the same reasons as their respective independent claims.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending (1) are in proper form, (2) are neither obvious nor anticipated by the relied upon art of record, and (3) are in condition for allowance. A Notice of Allowance is earnestly solicited at the earliest possible date. If the Examiner believes that a telephone conference would be useful in moving the application forward to allowance, the Examiner is encouraged to contact the undersigned at (310) 207-3800.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly, extension of time fees.

Respectfully submitted,

BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP

Dated: January 11, 2002

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on January 11, 2002.

Nadya Gordon — Date 1/11/02

Attachment: VERSION WITH MARKINGS TO SHOW CHANGES MADE

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

The Specification of record (including the Appendix as filed) has been substituted with the Substitute Specification as attached.

IN THE CLAIMS

The claims have been amended as follows.

20. (Amended) An article of manufacture for supporting a message delivery system, comprising:

a machine-readable medium containing instructions which, when executed by a processor, cause an internal packet switched data network to ~~be configured into~~perform as a plurality of processing servers each being capable of initiating communication with every one of a plurality of outbound resources and a database server that are part of the internal packet-switched data network, each processing server implements a router-filter and a message queue, the message queue to store request messages that are one of (1) addressed to, and (2) received from, a customer of the message delivery service, over an external packet switched data network, the router-filter to obtain a request message from the queue while polling the queue for pending requests, validate a customer associated with said request message after accessing the account information in the database server, and based on a message type of said request message determining which of the plurality of outbound resources to assign said request message to, and each of the plurality of outbound resources being capable of converting said request message, once assigned to it by the router-filter, into one of a format capable of being transmitted to a fax machine over a generalized

switched telephone network (GSTN), a format capable of being played back to a telephone over the GSTN, and a format capable of being transmitted to a paging terminal over the GSTN or to a paging gateway over the external network packet-switched network, based upon the message type of said request message.

21. (Amended) The article of manufacture of claim 20 wherein the machine readable medium includes further instructions which, when executed by the processor, ~~configure~~ cause the internal network ~~into~~ to perform as a private data network.

22. (Amended) The article of manufacture of claim 20 wherein the machine readable medium includes further instructions which, when executed by the processor, ~~configure~~ cause the router-filter to prioritize a plurality of request messages that have been obtained from the queue and that are assigned to an outbound resource.

23. (Amended) The article of claim 20 wherein the machine readable medium includes further instructions which, when executed by the processor, ~~configure~~ cause the router-filter to determine which of the plurality of outbound resources to assign said request message to, based on which resource offers the least cost of delivering said request message.

24. (Amended) The article of claim 20 wherein the machine readable medium includes further instructions which, when executed by the processor, ~~configure~~ cause the router-filter to generate an error message that indicates an error in delivering said request message as reported by the outbound resource to which said request message was assigned.

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UNITED STATES LETTERS PATENT APPLICATION

FOR

SCALABLE ARCHITECTURE FOR TRANSMISSION OF MESSAGES OVER A NETWORK

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BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to the field of message receipt/transmission and delivery using computer, phone, wireless and other communications networks. Specifically, the present invention relates to the transmission of e-mail messages which may be text only, text plus an audio file, text plus a video file, text plus a fax file or any combination thereof to a phone, pager or fax machine or other receiving device suitable for the message content, over appropriate communications networks using an architecture which enables easy expansion to handle additional message traffic as well as to connect to additional communications networks, including networks which do not presently exist which may become available in the future.

Description of Related Art

[0002] Voice and data communications systems such as the public switched telephone network (PSTN) are currently used to transfer image and text data transmitted by facsimile ("fax") machines in addition to the normally carried voice traffic. These faxed images are usually transmitted through the PSTN and received for printout or storage of the image on a destination fax machine or computer for the use by the recipient.

[0003] In U.S. ~~Application Serial No. 08/829,857 filed April 1, 1997~~Patent No. 6,208,638 entitled Method and Apparatus for Transmission and Retrieval of Facsimile and Audio Messages Over a Circuit or Packet Switched Network, it is disclosed that to provide for the receipt and transmission of audio and fax information by a first user over a circuit switched network such as the public switched telephone network (PSTN) to a second user over a packet switched network such as the Internet, a

communications server is connected both to the circuit switched network and a packet switched network.

[0004] The communications server contains resources to receive and process incoming audio and facsimile calls from the circuit switched network into a format suitable for transmission over the packet switched network to the second user's address. In addition, a link is first determined between the second user's address on the circuit switched network and the second user's address on the packet switched network, and then an appropriate route to the second user's address on the packet network is determined. With the system being maintained in a distributed and redundant fashion, reliable receipt and transfer of all messages is ensured. A copy of the specification and drawings of U.S. ~~Application Serial No. 08/829,857~~Patent No. 6,208,638 is attached hereto ~~as Appendix I~~.

[0005] However, the architecture utilized as described in U.S. ~~Application Serial No. 08/829,857~~Patent No. 6,208,638 is not easily scalable to handle increasingly higher levels of message traffic or to easily connect to networks in addition to the PSTN and the Internet. Figure 1 shows the essence of the architecture of U.S. ~~Application Serial No. 08/829,857~~Patent No. 6,208,638. An e-mail message is passed to an outbound resource 11 (communications server ~~150~~550 in U.S. ~~Application Serial No. 08/829,857~~Patent No. 6,208,638) which converts the e-mail message to a fax format or to audio for transmission to a fax machine or telephone connected to the PSTN. A database 13 stores customer information necessary for processing of messages (an unnumbered part of communications server ~~150~~550 in U.S. ~~Application Serial No. 08/829,857~~Patent No. 6,208,638 which is also contained in database server ~~195~~595 in U.S. ~~Application Serial No. 08/829,857~~Patent No. 6,208,638). After processing of an e-mail message by outbound resource 11, a fax or voice mail message is sent over the PSTN or more generally, a generalized switched telephone network (GSTN) which includes

cellular telephone networks as well as the PSTN. Optionally, a pager message may also be sent informing a user of the fax which has been sent or availability of a voice mail message as described in U.S. Patent ~~Application Serial No. 08/902,400 filed July 29, 1997~~No. 6,073,165 entitled Processing and Forwarding Messages From a Computer Network to a Forwarding Service.

SUMMARY OF THE INVENTION

[0006] ~~A method and apparatus for accepting an incoming message over a packet network and transmitting it over a circuit switched network using a highly scalable architecture~~A method and apparatus is disclosed for delivering messages that utilizes~~. The architecture utilizes~~ a message queue and a router/filter within a private data network.~~ which~~ The private network is connected to an external data network such as the Internet, ~~with~~ and has separate outbound resource servers to provide ~~the~~ a high degree of scalability~~,~~ for handling a variety of message types.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] **Figure 1** is a block diagram of a prior art architecture which performs the functions, but not the scalability of the architecture of the present invention.

[0008] **Figure 2** is a block diagram illustrating the architecture of the present invention.

[0009] **Figure 3** is a block diagram showing the data/control flow through message queue 21, router/filter 23 and database 27.

[0010] **Figure 4** (4a and 4b) is a flow diagram of the processing performed by router/filter 23.

[0011] **Figure 5** is a system diagram of a network containing a message server.

[0012] **Figure 6** is a block diagram illustrating the message server.

[0013] **Figure 7** is a flow diagram illustrating some operations.

DETAILED DESCRIPTION OF THE INVENTION

[0014] The present invention provides a method and apparatus for allowing the receipt and transmission of audio, video and fax information between a circuit switched network and a packet switched network. For purposes of explanation, specific embodiments are set forth to provide a thorough understanding of the present invention. However, it will be understood by one skilled in the art, that the invention may be practiced without these details. Further, although the present invention is described through the use of circuit switched and packet switched networks, most, if not all, aspects of the invention apply to all networks in general. Moreover, well-known elements, devices, process steps and the like are not set forth in detail in order to avoid obscuring the present invention.

[0015] Referring now to Figure 2, e-mail messages for a customer are sent to/through an external data network 15 (e.g., the Internet) and routed to an appropriate SMTP/HTTP (or SHTTP) server 17 as determined by a domain name server (DNS) 18 according to well known techniques. The e-mail message may be a text message or it may include a file, the content of which may be audio, video or bitmapped (e.g., a fax) or other data. Again, the techniques for creating and sending e-mail messages with these characteristics are well known.

[0016] A processing server 19, which includes a message queue 21 and a router/filter 23 first verifies that the message is from or is to a customer using information in database 27. After successful verification, the message is broken into fragments (in the case of files with multiple attachments) and written to message queue 21. Router/filter 23 obtains messages from the message queue and handles least call routing/billing/ prioritization/filtering of messages. Filtering is primarily for notification messages for pager delivery. After billing verification and determination of a least cost route, the message is assigned to one or more outbound resources 31 for

delivery to the intended recipient by a method or methods selected by the customer as previously recorded in database 27.

[0017] In the case of faxes, the outbound resource is a server which dials the destination fax number and sends the fax.

[0018] In the case of voice messages, the outbound resource is a server which dials the destination telephone number and plays the voice message.

[0019] In the case of notification messages, the outbound resource is a server which dials out to the paging terminal or delivers the notification message through any appropriate paging gateway.

[0020] After the message (in whatever form) has been delivered, a receipt with details and an error log (if any) is sent back via a secure protocol to the message queue 21.

[0021] The receipt/error log messages are then processed by the router/filter which interfaces with a billing system (not shown) for customer account update.

[0022] **Figure 3** is a block diagram showing the data/control flow through message queue 21, router/filter 23 and database 27 using information contained in the following tables as explained with reference to Figures 4a and 4b.

MESSAGE_ID	This is a unique number assigned to each message that arrives in the system.
RESOURCE_ID	Unique number assigned to each Outbound Resource
RESOURCE_TYPE	Each Resource is identified by the type of messages it can deliver (e.g., FAX, VOICE, NOTIFY, etc.)
RESOURCE_ADDRESS	Location of the Resource (such as IP address)
MESSAGE_TO_EMAIL_ADDRESS	To: address of the message
MESSAGE_FROM_EMAIL_ADDRESS	From: address of the message
MESSAGE_LOCATION	Location of actual message on the Message Queue 21
MESSAGE_SIZE	Size of the message in bytes
MESSAGE_PRIORITY	Priority of the message (e.g., low, medium, high)
MESSAGE_CREATION_DATE	Timestamp identifying the date/time that the message was received by the system
MESSAGE_EXPIRY_DURATION	Amount of time after which the message becomes stale
MESSAGE_SCHEDULED_DATE	Scheduled delivery timestamp for the message
MESSAGE_STATUS	Current status of the message (Active, Pending, Sent, etc.)
MESSAGE_ESTIMATED_COST	Estimated cost for the delivery of the message
CUSTOMER_KEY	Unique number identifying the customer in the database
MESSAGE_PART_OF_BROADCAST	Flag identifying if the message is part of a larger broadcast list waiting to be delivered
BROADCAST_ID	Unique number identifying a broadcast list
COVERPAGE_ID	Unique number identifying a coverpage (if any) for a fax
MESSAGE_SUBJECT	Subject line of the message to be delivered
MESSAGE_DURATION	Duration of the message (delivery time of fax, or delivery time for a voice message, etc.)
MESSAGE_RATE	Rate for message delivery (dollars per second, etc.)
MESSAGE_SEND_DATE	Actual timestamp identifying when the message was delivered
MESSAGE_REMOTE_CSID	Identifier of the fax machine to which a FAX message was delivered
MESSAGE_TYPE	Type of message (e.g., FAX, VOICE, NOTIFICATION, etc.)
RESOURCE_COMMUNICATION_TYPE	Protocol used to communicate with the resource (HTTP, SHTTP, etc.)
MESSAGE_LANGUAGE_CODE	Language used for delivery of a receipt or response, based on settings in the customer table
MESSAGE_PAGES	Number of pages of a message (used primarily for a fax)

Table 1 Message Queue Table

FILETYPE_MESSAGE_TYPE	Identifier of a message type (FAX, VOICE, etc.)
FILETYPE_RESOURCE_TYPE	Identifier to determine a resource that can handle a particular file type
FILETYPE_EXTENSION	The filename extension that identifies a file type (e.g., WAV, TIF, JFX, AU, GSM, etc.)

Table 2 File Type Table

CUSTOMER_KEY	Unique number identifying a customer in the database
FIRSTNAME	First name of customer
LASTNAME	Last name of customer
COMPANY	Company name of customer
ADDRESSLINE1	Company address
ADDRESSLINE2	Company address
CITY	Company city
MAILREGION	Company state or equivalent
MAILCODE	Zipcode or equivalent
COUNTRY	Company country
WORKNUMBER	Customer work phone number
HOMENUMBER	Customer home phone number
EMAILADDRESS	Email address of customer
COLLECTIONMETHOD	Collection method such as Credit card, Debit, etc.
BILLTYPE	e.g., Customer, Demo, free, corporate, etc.
STATUS	Status of customer, Active, Inactive, etc.
LANGUAGECODE	Language of customer, English, German, etc.
CURRENCYCODE	Currency for billing the customer, US Dollars, Pound Sterling, etc.

Table 3-Customer Table

FORMAT	Currency label
CURRENCY_SYMBOL	Symbol for currency

Table 4-Currency Table

CUSTOMERKEY	Unique number identifying a customer in the database
PAGERTYPECODE	Code to determine the kind of pager service
BBSNUMBER	Modem number for pager notification delivery, based on the pager type
PAGERNUMBER	Identifier number of the pager unit
PIN	PIN code for the pager unit
DISPLAYTYPE	Display type of the pager (numeric, alphanumeric, etc.)

Table 5-Notification Table

RESPONSE_ID	Unique ID for a response/receipt message to be sent to a customer
REPONSE_SUBJECT	Subject line of the response message
RESPONSE_FROM_EMAIL	From: line of the response message
RESPONSE_BODY	Actual text of the response message

Table 6-Response_email Table

RESOURCE_ID	Unique identifier for the resource
RESOURCE_TYPE	Type of resource (FAX, VOICE, etc.)
RESOURCE_STATUS	Status of resource (Active, Inactive, etc.).
RESOURCE_QUEUE_STATUS	Status of the Queue, number of messages in queue
RESOURCE_TIME_ZONE	Time zone for the resource
RESOURCE_QUEUE_MAX	Maximum size of the resource queue
RESOURCE_ADDRESS	Address of the resource (IP address, etc.)
RESOURCE_NAME	Name of the resource
RESOURCE_EXPIRY_DURATION	Expiry duration for any message sent to the specified resource
RESOURCE_QUEUE_IN_STATUS	Number of messages waiting to be delivered by the resource
RESOURCE_COMMUNICATION_TYPE	Method used to communicate with resource (HTTP, SHTTP, etc.)

Table 7-Resource Table

RESOURCE_ID	Unique identifier for the resource
RESOURCE_PREFIX	Any digits to be dialed before an actual number
RESOURCE_CITY_NAME	Name of destination city for the message to be delivered
RESOURCE_PROVIDER_RATE	Rate for a particular city (dollars per second, etc.)
RESOURCE_MAX_DIGITS	Max number of digits allowed to be dialed
RESOURCE_AREA_CODE	Area code for the particular city

Table 8-Resource Rates Table

[0023] **Figures 4a** and **4b** are a flow diagram of the processing performed by router/filter 23 using Tables 1-8. When a message is received it is placed into message queue 21 which is simply a storage area, the specifics of which, including the mechanism for placing the message into the queue are well known. Certain details concerning the message are also stored in a message queue table (Table 1). In step 41, router/filter, which is a computer program running on processing server 19, polls the message

queue table for pending requests as determined by the existence of an active message in the message status field. If no message is found, after a system defined delay, the message queue table is again polled (step 43). Once a message has been found in the table, processing continues with step 45 by determining the message type using the message_type field in Table 1 and the file type information in Table 2. The customer is then validated using information in Table 3 in step 47. In step 49, currency information for the customer is obtained from Table 4. The message is then filtered for possible pager notification using the information in Table 5 in step 51. In step 53, Table 7 is used to check for available resources to deliver the message. In step 55, the rates of available resources are checked to determine the least cost resource using Table 8. Then in step 59, the message is delivered using the determined least cost resource. After the message has been delivered, or after an error in the delivery has occurred, in step 59, a response/receipt is composed using Table 6. In step 61, the response or receipt is delivered to the sender. The system then begins the process over again at step 41.

[0024] As noted above outbound resource 31 is equivalent to communications server ~~150~~550 as described in U.S. ~~Application Serial No. 08/829,857~~Patent No. 6,208,638. The modifications made to outbound resource to enable it to operate in a system having an architecture as described herein are as follows.

[0025] These changes will be described with reference to the message structure of received messages.

Message structure

[0026] Each field has a value following an '=' sign and is terminated by a newline character. The exception to this is the "Message" field where a newline immediately follows the '=" sign and the actual message follows on the next line.

[0027] The fields of a message are as follows:

Password=

MessageID=

MessageStatus=

MessageSentTimeStamp=

MessageDuration=

MessageLength=

MessageRemoteCSID=

MessageSourceCSID=

MessageAttachStatus=

MessageDestination=

ResourceID=

ResourceStatus=

ResourceLastCommTimeStamp=

ResourceExpiryDuration=

ResourceQueueInStatus=

ResourceQueueOutStatus=

ResourceChannelMax=

ResourceChannelStatus=

MessageBoundary=

Message=

[0028] In the following explanation of the above fields, the text in brackets at the end indicates the entity providing the value for the field in the forward/reverse direction (i.e., from router/filter 23 (RF) to outbound resource 31 (RESOURCE), and from RESOURCE to RF, respectively). "NA" indicates that no value is applicable, and the text "NA" is used to populate the field. "Same" indicates that the same value is used

in the reverse direction, i.e, the RESOURCE does not modify the value; it only echoes the value it receives in that field.

Password - There is a fixed password pair for each RESOURCE and RF combination. RESOURCE stores the RF password in a flat text password file in a directory (jfaxom), and RF stores the RESOURCE password in the database. (RF/RESOURCE).

MessageID – Unique ID, per message, generated by RESOURCE. (RESOURCE/Same).

MessageStatus – Code indicating current status of the message. See Status codes below. (RF/RESOURCE)

MessageSentTimeStamp – Time stamp indicating date/time the message was delivered to the final destination by RESOURCE. (NA/RESOURCE)

MessageDuration – Time (in seconds) to transmit message from RESOURCE. (NA/RESOURCE)

Messagelength – Number of pages transmitted by RESOURCE. (NA/RESOURCE)

MessageRemoteCSID – called subscriber identification (CSID) of fax machine to which message was transmitted. (NA/RESOURCE)

MessageSourceCSID – Source CSID. This may be customized per customer. (RF/Same)

MessageAttachStatus – Value of "A" indicates a message is attached for delivery. (RF/RESOURCE)

MessageDestination – Destination phone number. (RF/Same)

ResourceID – Unique ID, per resource, stored in the database. (RF/Same)

ResourceStatus – Code indicating the current status of the resource, i.e., whether it is active or not. RF uses this to determine whether further messages should be sent to RESOURCE for delivery. See Status codes below. (NA/RESOURCE)

ResourceLastCommTimeStamp – Date/time of last communication between RF and RESOURCE. (RF/RESOURCE)

ResourceExpiryDuration – Life of message (in minutes) on RESOURCE. If a message has not been delivered to the final destination by RESOURCE within this amount of time, the message is considered "expired" and is discarded.

ResourceQueueInStatus – Number of messages waiting to be processed in an Inbox directory on RESOURCE. (NA/RESOURCE)

ResourceQueueOutStatus – Number of messages waiting to be processed in an Outbox directory on RESOURCE. (NA/RESOURCE)

ResourceChannelMax – Number of channels available for use on RESOURCE. (NA/RESOURCE)

ResourceChannelStatus – Channel activity status, e.g., 0000000111000001, where 0's indicate an idle channel and 1's indicate a busy channel. (NA/RESOURCE)

MessageBoundary – Text for MIME boundary. (RF/NA)

Message - Actual MIME message sent by RF. If MessageAttachStatus=NA, no message follows this tag.

All fields are NA if not used.

Date fields are expressed in MMDDYYhhmmss format.

Resource Status Codes are:

A – Active

I – Inactive

Message Status Codes are:

P – Pending

H – On Hold

D – Deferred

R – Ready for sending to RESOURCE

X – Exchanged, i.e., sent to RESOURCE but not acknowledged by it.

A – Sent to RESOURCE and acknowledged by it.

S – Sent (i.e., receipt for final delivery received from RESOURCE)

Normal sequence for Message delivery by RESOURCE is:

RF receives a request in its queue (message queue 21).

RF sends the message to RESOURCE.

RESOURCE gets message, authenticates password, and creates a new message in the Inbox directory.

RESOURCE acknowledges receipt of message.

RESOURCE processes the message in Inbox (MessageStatus=A, MessageAttachStatus=A).

RESOURCE moves message to a Process directory for further processing.

RESOURCE finishes processing message and delivers it to final destination.

RESOURCE removes the message from the Process directory.

RESOURCE creates a message in Outbox directory. (MessageStatus=S). If a "reply message" is to be delivered to the original sender, MessageAttachStatus=A, else MessageAttachStatus=NA. MessageID remains the same in either case.

RESOURCE delivers receipt (with "reply message," if applicable) to RF.

RF receives the message and puts it in the Queue for database processing.

[0029] Processing server 19 with the above described functionality may be implemented using readily available systems such as a Windows NT server or a UNIX server. Database 27 may be implemented as a database server using readily available systems such as a Windows NT server or a UNIX server running, for example a SQL database.

~~While the present invention has been particularly described with reference to the various figures, it should be understood that the figures are for illustration only and should not be taken as limiting the scope of the invention. Many changes and~~

~~modifications may be made to the invention, by one having ordinary skill in the art, without departing from the spirit and scope of the invention.~~

[0030] What follows is a detailed description of **Figures 5-7** which set forth a method and apparatus for allowing the receipt and transmission of audio and fax information between a circuit switched network and a packet switched network, as described in U.S. Patent No. 6,208,638. For purposes of explanation, specific embodiments are set forth to provide a thorough understanding of the present invention. However, it will be understood by one skilled in the art, from reading this disclosure, that the invention may be practiced without these details. Further, although the system is described through the use of circuit switched and packet switched networks, most, if not all, aspects apply to all networks in general.

[0031] **Figure 5** contains a block diagram illustrating an embodiment of a system containing a communications server 550 connected to a circuit switched network 530 and a wide area network (WAN) 580. In an embodiment, the circuit switched network 530 is a circuit switched network such as the PSTN while WAN 580 is a packet switched network such as the Internet. It is to be noted that circuit switched network 530 can also be a network such as the generalized switched telephone network (GSTN), which encompasses PSTN networks, cellular telephone networks, and the other networks with which they are in communication.

[0032] Communications server 550 is connected to circuit switched network 530 via a switch 540 and to WAN 580 through the use of a router 585. As described in further detail below, in an embodiment, switch 540 and router 585 are interfaced to communications server 550 using two separate hardware interfaces. In an alternate embodiment, switch 540 and router 585 can be interfaced to communications server 550 through the use of one hardware unit.

[0033] Connected to circuit switched network 530 is both a telephone unit 510 and a facsimile unit 520. Telephone unit 510 is a standard telephone capable of

converting audio signals into electrical signals suitable for transmission over circuit switched network 530. Similarly, facsimile unit 520 is a standard facsimile machine capable of transmitting and receiving facsimile messages over circuit switched network 530. Each of these devices can be connected to circuit switched network 530 using either wired or wireless technology.

[0034] Connected to WAN 580 is a database server 595, a system management unit 597, a mail server 560, and a client 590. Each of these systems communicate with each other and with communications server 550 via WAN 580 using such protocols such as simple network management protocol (SNMP) and hyper-text transport protocol (HTTP)--packetized using a protocol such as the transmission control protocol/internet protocol (TCP/IP).

[0035] In an embodiment, each one of database server 595, system management unit 597, mail server 560, and client 590, are stand-alone computers or workstations containing the hardware and software resources to enable operation. In alternate embodiments, the functions provided by each one of database server 595, system management unit 597, mail server 560, and client 590, are provided by any number of computer systems.

[0036] In an embodiment, mail server 560 is a server providing e-mail receipt and transmission using a protocol such as the simple mail transfer protocol (SMTP) and post office protocol (POP). Moreover, client 590 is configured to be able to communicate over WAN 580 using SMTP or POP in order to retrieve e-mail from mail server 560 or another suitably configured server.

[0037] System management unit 597 communicates with communications server 550 to monitor: (1) the processes on communications server 550; (2) the status of the trunk line connected to communications server 550; and (3) the connection between the various servers connected to WAN 580. As described below, if any processes on communications server 550 or connection to the circuit switched network 530 is

interrupted, system management unit 597 can allocate resources, or cause the re-routing of a call or message via one or more redundant resources or connections, ensuring that the call or message is routed to the final destination.

[0038] Communications server 550 contains user data needed to receive and route incoming messages received from circuit switched network 530. The same information is also stored on database server 595. In an embodiment, communications server 550 stores an inbound address, a set of final destination addresses; and an account status for each user. The inbound address corresponds to the telephone number assigned to the user. As further discussed below, the inbound address is the number that a message sender dials on telephone unit 510 or facsimile unit 520 to leave a message for the user. The set of final destination address contain one or more e-mail addresses where the user account status information indicates whether the inbound address is either active and or inactive--i.e, whether the user is able to receive messages using the system.

[0039] Database server 595 stores a duplicate copy of the inbound address, the set of final destination addresses; and the account status for each user. Database server 595 also stores additional information for each user such as mailing address and billing information which are not used in the operation of the present invention but are note herein for completeness only. Thus, the information that is stored on communications server 550 is a subset of the information that is stored on database server 595, and if communications server 550 were to become inoperable or otherwise unable to handle incoming messages, database server 595 can configure another communications server to accept those calls.

[0040] In an embodiment, system management unit 597 is responsible for monitoring the status of communications server 550 and re-assigning the users being handled by communications server 550 if communications server malfunctions or becomes overloaded with incoming calls. In the former case, system management unit

597 would re-assign all users being handled by communications server 550 to another communications server. In the latter case, system management unit 597 would only off-load the only those incoming calls for which communications server 550 does not have the available resources to process.

[0041] **Figure 6** is a block diagram of communications server 550 configured in accordance with an embodiment containing a processor 651 coupled to a memory subsystem 653 through the use of a system bus 655. Also coupled to system bus 655 is a network interface 656; a trunk interface 652; and a set of fax/voice processing resources 654. Set of fax/voice processing resources 654 and trunk interface 652 are also coupled to a bus 657.

[0042] Bus 657 is a bus that supports time division multiplex access (TDMA) protocols to optimize the flow of real time traffic between set of fax/voice processing resources 654 and trunk interface 652.

[0043] Memory subsystem 653 is used to store information and programs needed by communications server 550. The functioning of memory subsystems in computer design are well known to those of ordinary skill in the art and thus will not be further discussed herein.

[0044] In an embodiment, trunk interface 652 is a trunk line interface, such as a T-1 or E-1 line, to switch 540 and can handle up to 24 channels of communications. Trunk line signaling is well known to those of ordinary skill in the art of telecommunication and thus will not be further discussed herein except as necessary for describing the invention.

[0045] Set of fax/voice processing resources 654 are made up of multiple fax/voice processing cards. Each of these processing cards contain processing units which are capable of receiving and transmitting facsimiles according to established protocols, and which are capable of digitizing voice or other audio data, also according to established protocols. In an embodiment, there are three fax/voice processing cards

in set of fax/voice processing resources 654, each fax/voice processing card containing eight processing units capable of handling a channel from trunk interface 652. Thus, communications server 550 can communicate on twenty-four channels concurrently.

[0046] The storage of destination addresses on both circuit switched network 530 and WAN 580 is controlled by a database located either on communications server 550 or on database server 595. Keeping this information separate from communications server 550 allows communications server 550 to be a resource that can be allocated on demand. Hence, a number of communications servers could be used, along with one or more database servers, to allow a fully redundant and scalable system. In addition, system management unit 597 monitors the status and connection of all the communication and database servers.

[0047] **Figure 7** is a flow diagram illustrating the operations of an embodiment of the present invention when a call originating from a source on the circuit switched network 530. For example, either telephone unit 510 or facsimile unit 520 can initiate the call.

[0048] In block 700, an incoming call signal is received by communications server 550 from switch 540. The incoming call signal is initiated by telephone unit 510 or facsimile unit 520 over circuit switched network 530 and is routed to communications server 550 via switch 540. Communications server 550 detects the incoming call signal using trunk interface 652. Operation would continue with block 702.

[0049] Continuing with block 702, trunk line interface unit 652, in addition to receiving signals to indicate that there is an incoming call from switch 540, also receives signals indicating the circuit destination address of the incoming call. The destination address is captured by trunk interface 652 and is determined by trunk line signaling using mechanisms such as direct-inward-dial, or dual tone multifrequency (DTMF) tones.

[0050] Continuing with block 704, to determine whether or not to process the incoming call, processor 651 searches the list of inbound addresses contained in memory subsystem 653 for the destination address. If processor 651 finds the destination address in the inbound address list, processor 651 will then look up the account status for the user who owns the inbound address to determine if the account of that user is a valid user account. In an alternate embodiment, the validation is performed through the use of a database maintained by a separate entity such as database server 595. If the account is found to be inactive, communications server 651 will play a prepared message indicating that the number to which the incoming message was sent is an invalid account.

[0051] In block 706, once the validity of the user account has been established, processor 651 will attempt to allocate one fax/voice processing resource from set of fax/voice processing resources 654 and also determine the availability of other resources required for the receipt and processing of the incoming call. These other resources include the processing capacity of processor 651, the storage capacity of memory subsystem 653.

[0052] If it is determined that the appropriate resources are not available, then the call will be routed to a different communications server that is capable of allocating the necessary resources. The routing of calls is accomplished by trunk line signaling via switch 540 and is managed by system management unit 597.

[0053] Also, it should be noted that the call will only come from switch 540 to communications server 550 if there are no problems with the line. Otherwise the call will get routed to a different communications server. In an embodiment, fault detection and correction happens in one of two ways. First, on the telephone network side, switch 540 can be set up to independently route a call to another line if it is determined that one of the lines is bad. Second, if communications server 550 detects that the trunk line coming into trunk interface 652 is down, communications server 550 will notify

system management unit 597 to reallocate the users for whom communications server 550 is responsible onto another communications server. Thus, system management unit 597 will transfer the duplicate user information contained in database server 595 into a different communications server.

[0054] In block 708, communications server 550 "answers" the incoming call by having trunk interface 652 go "off-hook" on the trunk line.

[0055] In block 710, if the fax/voice processing resource of set of fax/voice processing resources 654 which is processing the call determines that the incoming call is a fax transmission, then operation will continue with block 712. Otherwise, operation will continue with block 714. For example, if the call is a fax, a fax protocol is initiated, and the fax is received by one of the fax/voice processing resources of set of fax/voice processing resources 654. If the call is a voice call, the voice is recorded by one of the fax/voice processing resources of set of fax/voice processing resources 654.

[0056] In block 712, the fax/voice processing resource of set fax/voice processing resources 654 responsible for processing the incoming call will perform the fax transfer and store the incoming message as a temporary file in memory subsystem 653. In an embodiment, the incoming fax is saved into a file which follows the group 3 facsimile file format. Operation will then continue with block 716.

[0057] In block 714, where it is determined that the incoming message is an audio message, the fax/voice processing resource of set of fax/voice processing resources 654 allocated to process the call will initiate an audio recording of the incoming voice message. In an embodiment, the audio message is digitized and stored in memory subsystem 653 as a temporary file in a pulse code modulated format. After the incoming call has been digitized and stored, operation will then continue with block 716.

[0058] In block 716, trunk interface 652 will terminate the call. Operation will then continue with block 718.

[0059] In block 718, the incoming message, which has been stored as a temporary file in memory subsystem 653, is processed by processor 651. In an embodiment, the temporary file is processed according to the type of the incoming call. If the incoming call was a fax transmission, then the temporary file, which has been stored as a group 3 facsimile file, will be converted into a file which follows the tagged image file format (TIFF), or a format that is suitable for transmission over WAN 580. Optionally, the temporary fax file can also be compressed at this stage. If the incoming call was an audio message, then the temporary file would be compressed using a compression scheme such as the scheme defined in the global system for mobile-communications (GSM) standard. In alternate operations, compressing and other processing of the incoming message is performed as the same time the incoming message is being received and being placed in memory subsystem 653.

[0060] In block 720, communications server 550 uses the inbound address to determine the set of final destination addresses, which are destinations on WAN 580 (i.e., the packet switched network), to send the processed incoming message. Communications server 550 then sends an electronic mail (e-mail) with the processed incoming message as an attachment to all the destinations in the set of final destination addresses.

[0061] For example, the e-mail containing the attachment is transferred to, and stored in, a server such as mail server 560, The e-mail is then retrieved by client 590 whenever the user wishes. In an alternate embodiment, client 590 can retrieve the e-mail directly from communications server 550, without the storing operation of mail server 560.

[0062] While the present invention has been particularly described with reference to the various figures, it should be understood that the figures are for illustration only and should not be taken as limiting the scope of the invention. Many changes and

modifications may be made to the invention, by one having ordinary skill in the art, without departing from the spirit and scope of the invention.

[0063] ABSTRACT OF THE INVENTION

[0064] ~~A method and apparatus for accepting an incoming message over a packet network and transmitting it over a circuit switched network using a highly scalable architecture~~A method and apparatus is disclosed for delivering messages that utilizes~~. The architecture utilizes~~ a message queue and a router/filter within a private data network.~~ which~~ The private network is connected to an external data network such as the Internet, ~~with~~ and has separate outbound resource servers to provide ~~the~~ a high degree of scalability~~,~~ for handling a variety of message types.

~~APPENDIX I~~

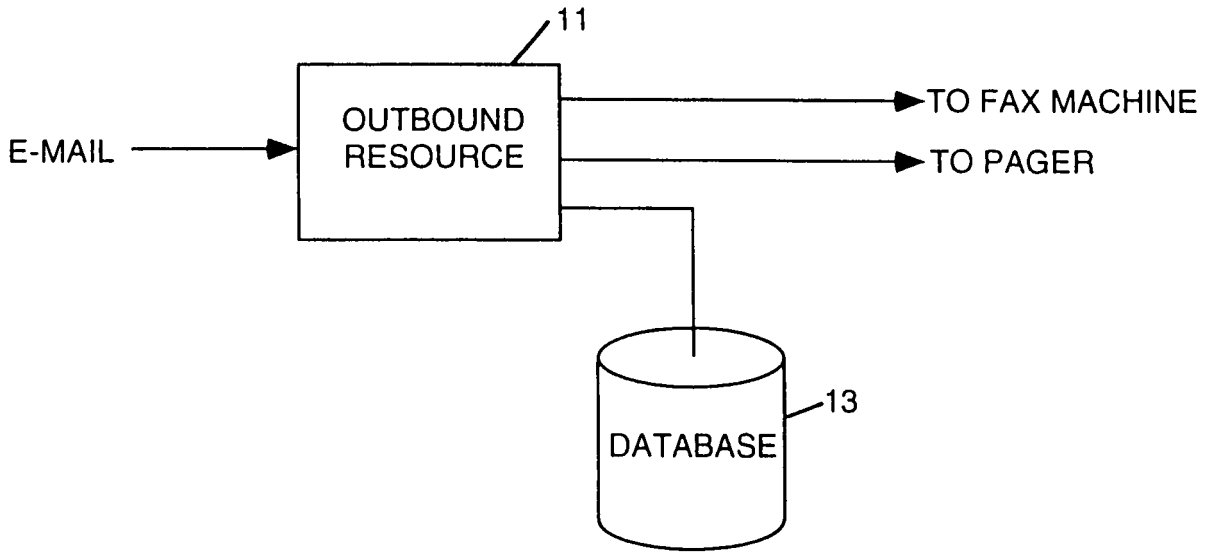

Fig. 1

PRIOR ART

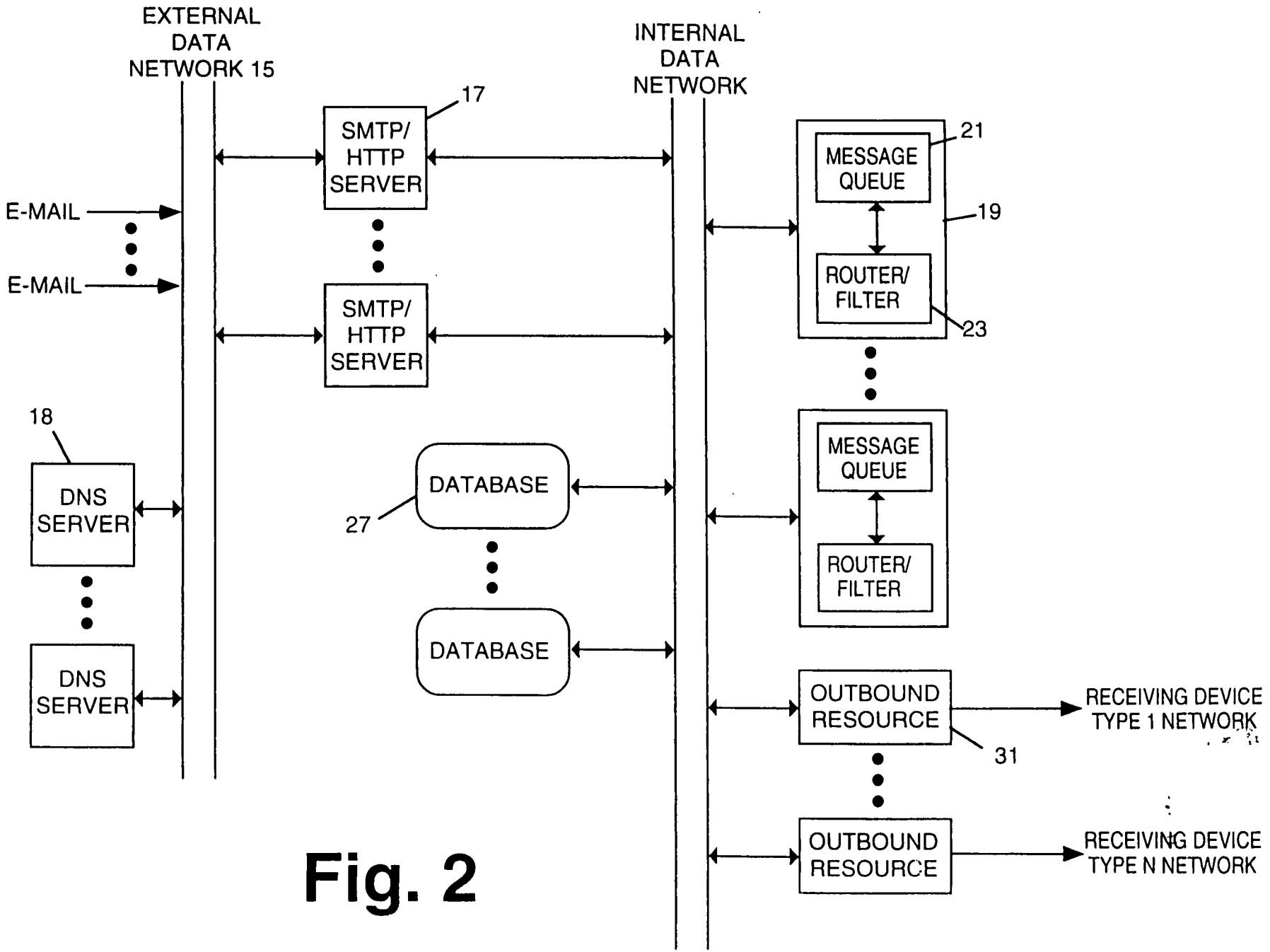
EXTERNAL DATA NETWORK 15
INTERNAL DATA NETWORK
17
SMTP/ HTTP SERVER
SMTP/ HTTP SERVER
E-MAIL
E-MAIL
18
DNS SERVER
DNS SERVER
DATABASE
27
DATABASE
21
MESSAGE QUEUE
19
ROUTER/ FILTER
23
MESSAGE QUEUE
ROUTER/ FILTER
OUTBOUND RESOURCE
31
RECEIVING DEVICE TYPE 1 NETWORK
OUTBOUND RESOURCE
RECEIVING DEVICE TYPE N NETWORK

Fig. 2

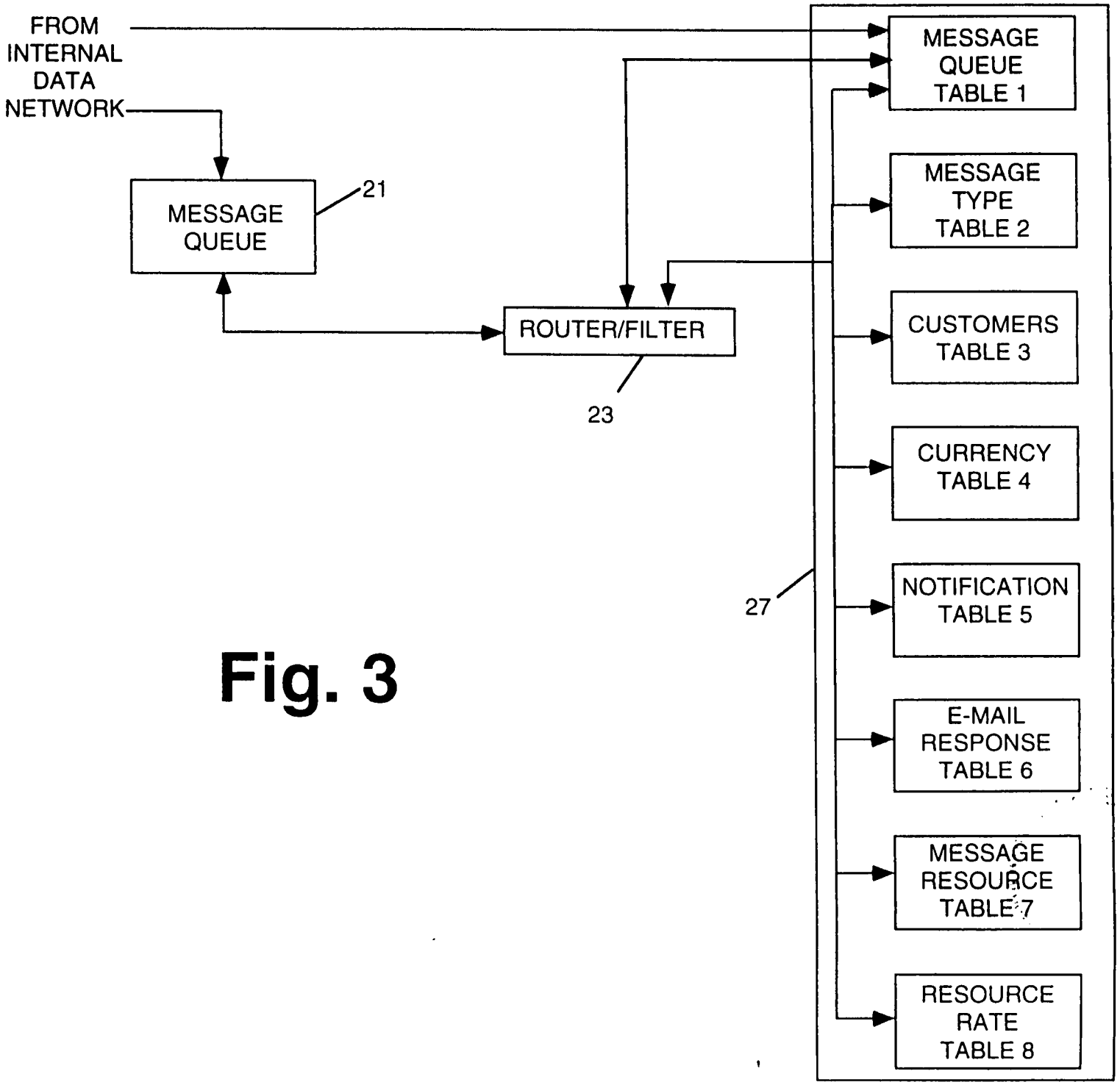
FROM INTERNAL DATA NETWORK
MESSAGE QUEUE
21
ROUTER/FILTER
23
27
MESSAGE QUEUE TABLE 1
MESSAGE TYPE TABLE 2
CUSTOMERS TABLE 3
CURRENCY TABLE 4
NOTIFICATION TABLE 5
E-MAIL RESPONSE TABLE 6
MESSAGE RESOURCE TABLE 7
RESOURCE RATE TABLE 8

Fig. 3

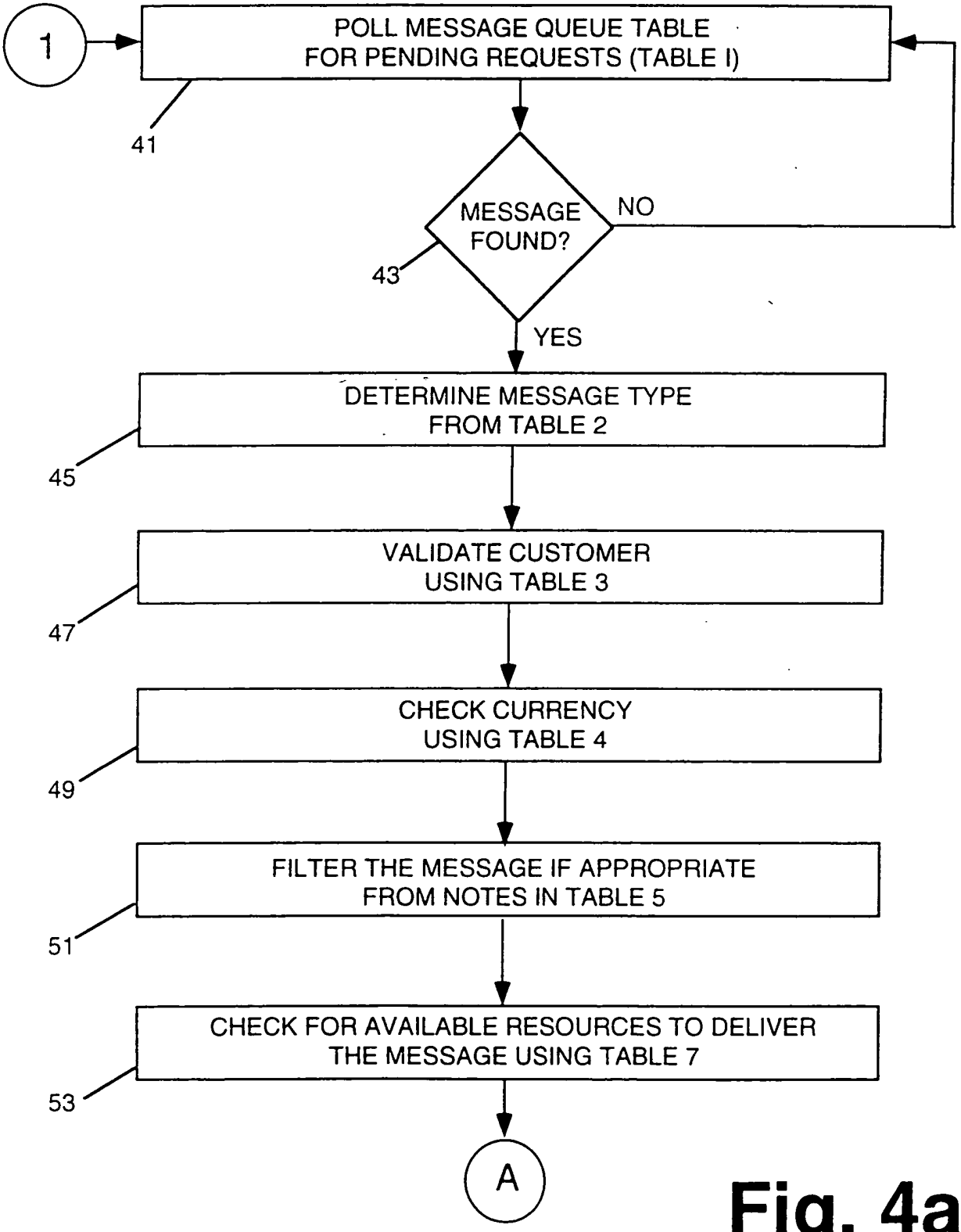
1
POLL MESSAGE QUEUE TABLE FOR PENDING REQUESTS (TABLE I)
41
MESSAGE FOUND?
NO
43
YES
DETERMINE MESSAGE TYPE FROM TABLE 2
45
VALIDATE CUSTOMER USING TABLE 3
47
CHECK CURRENCY USING TABLE 4
49
FILTER THE MESSAGE IF APPROPRIATE FROM NOTES IN TABLE 5
51
CHECK FOR AVAILABLE RESOURCES TO DELIVER THE MESSAGE USING TABLE 7
53
A

Fig. 4a

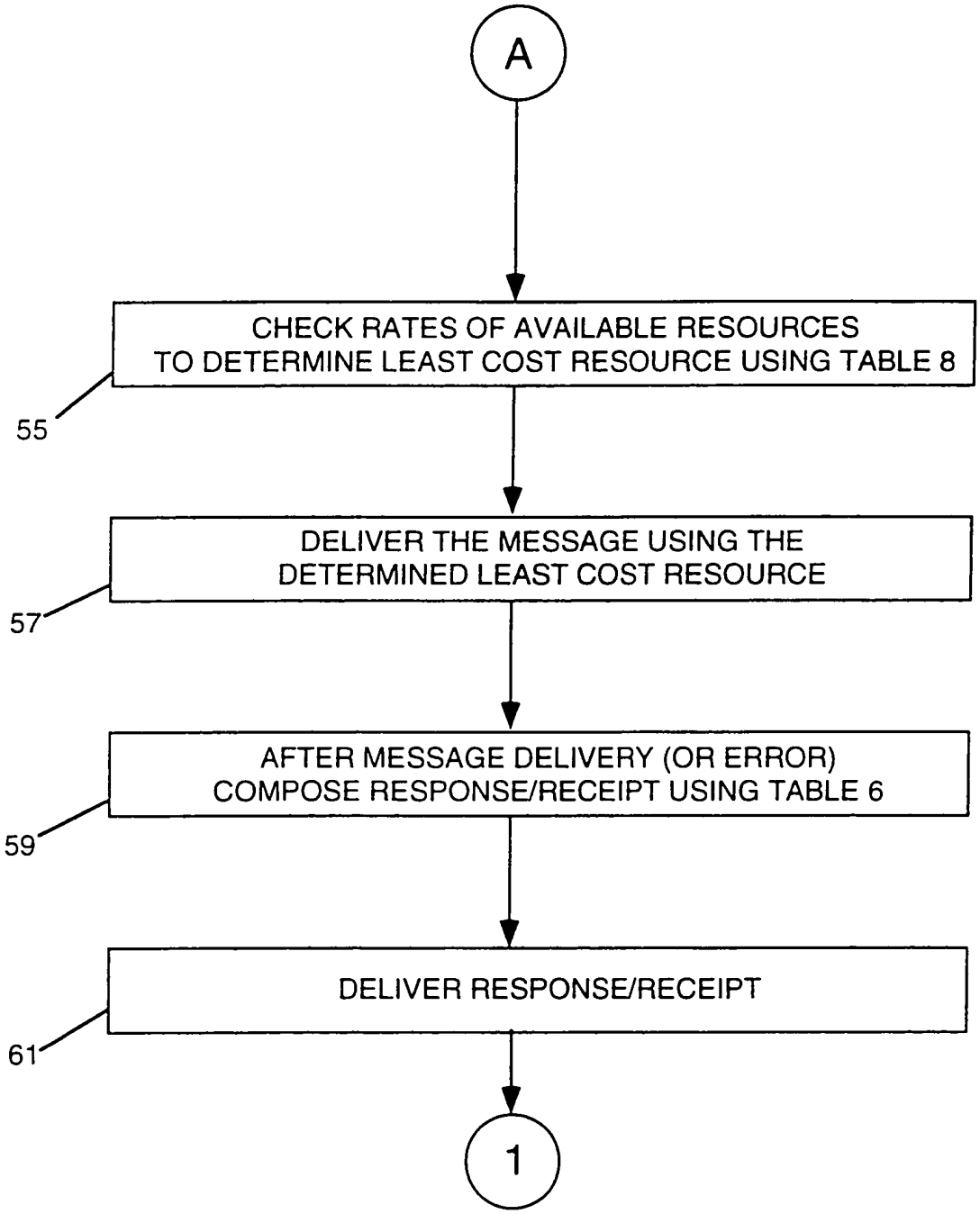
A
CHECK RATES OF AVAILABLE RESOURCES
TO DETERMINE LEAST COST RESOURCE USING TABLE 8
55
DELIVER THE MESSAGE USING THE
DETERMINED LEAST COST RESOURCE
57
AFTER MESSAGE DELIVERY (OR ERROR)
COMPOSE RESPONSE/RECEIPT USING TABLE 6
59
DELIVER RESPONSE/RECEIPT
61
1

Fig. 4b

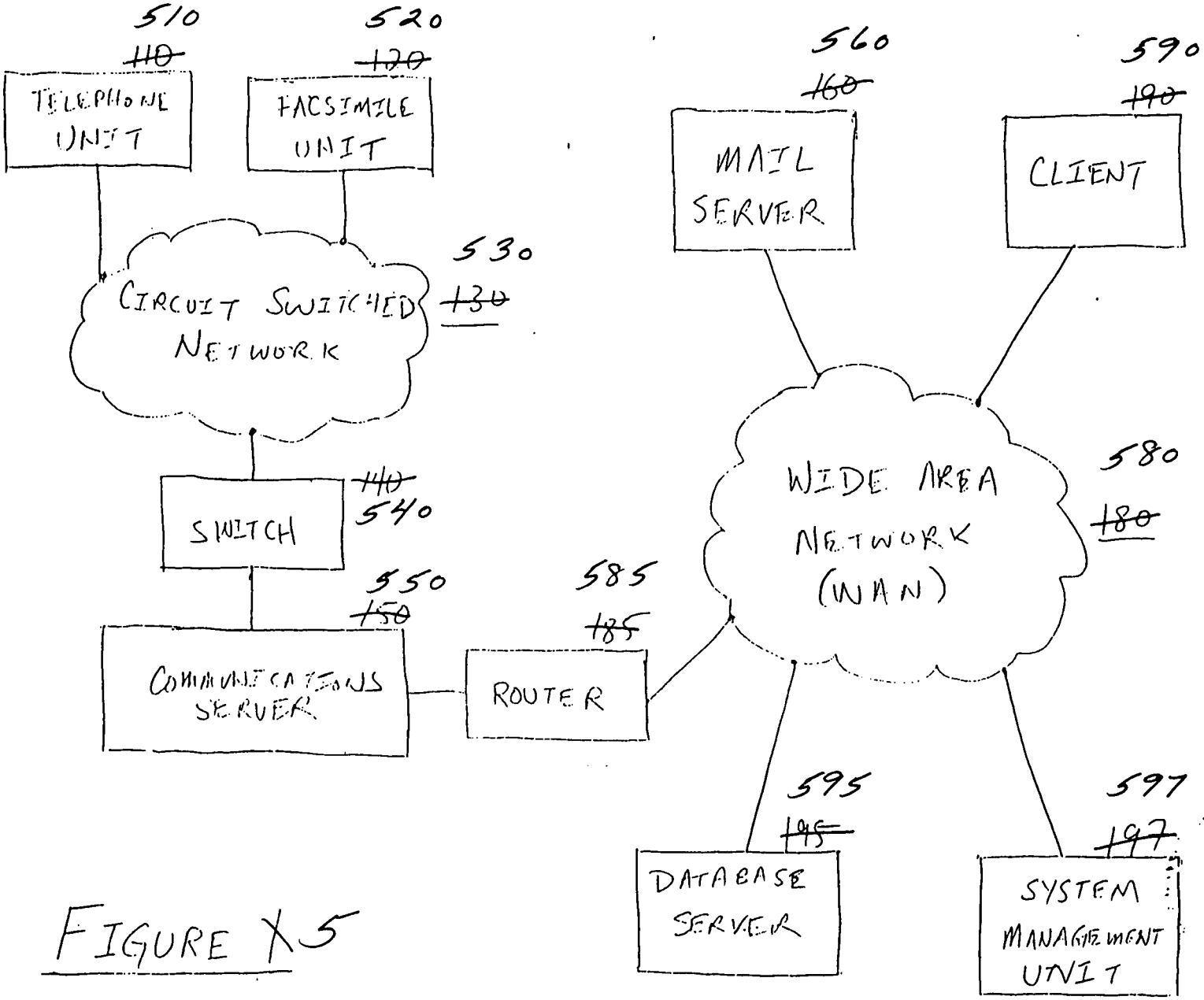
510
~~110~~
TELEPHONE UNIT
520
~~120~~
FACSIMILE UNIT
560
~~160~~
MAIL SERVER
590
~~190~~
CLIENT
530
~~130~~
CIRCUIT SWITCHED NETWORK
~~140~~
540
SWITCH
550
~~150~~
COMMUNICATIONS SERVER
585
~~185~~
ROUTER
WIDE AREA NETWORK (WAN)
580
~~180~~
595
~~195~~
DATABASE SERVER
597
~~197~~
SYSTEM MANAGEMENT UNIT

FIGURE X5

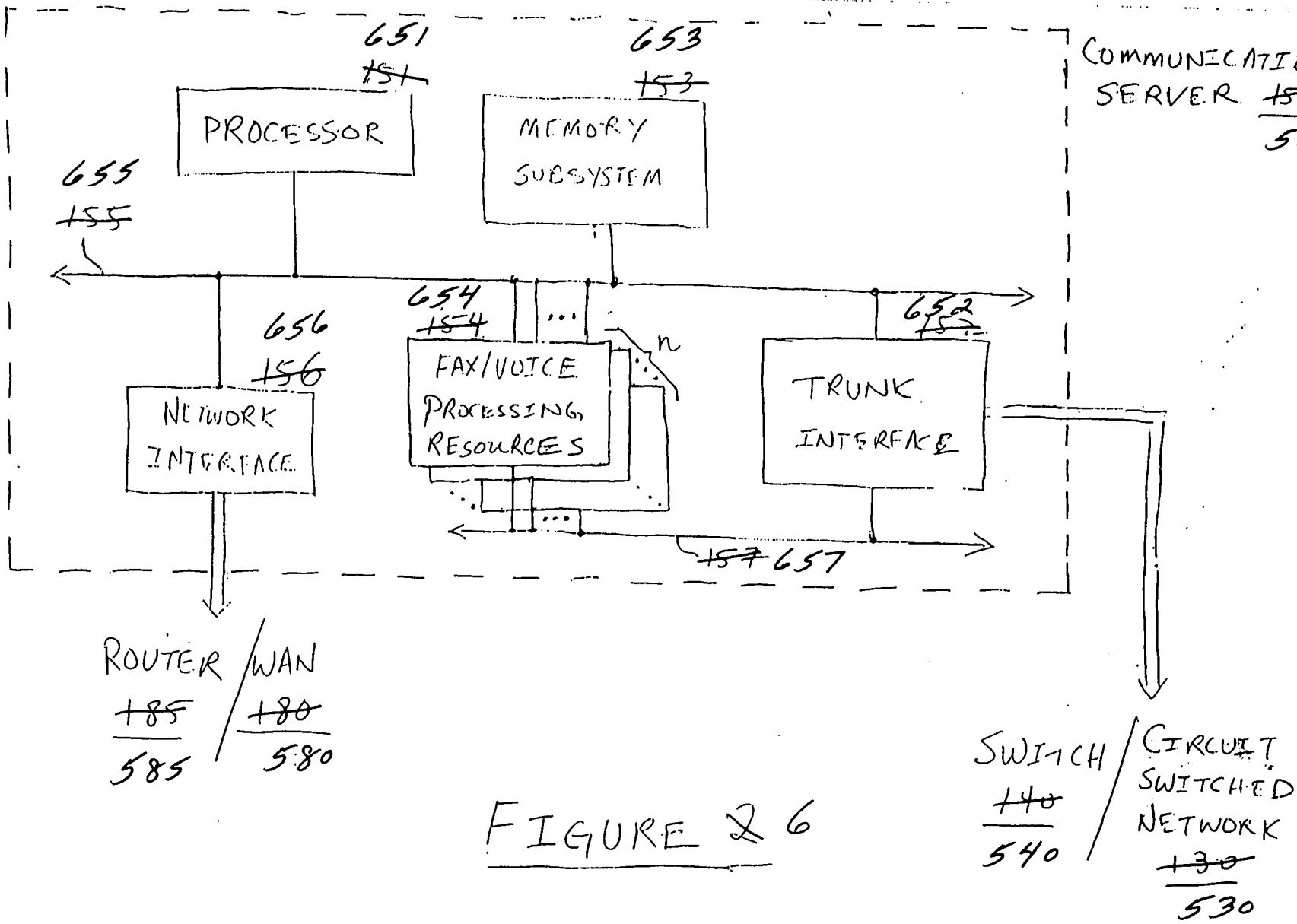
651
151
653
153
COMMUNICATIONS SERVER 150
550
PROCESSOR
MEMORY SUBSYSTEM
655
155
654
154
656
156
652
152
n
NETWORK INTERFACE
FAX/VOICE PROCESSING RESOURCES
TRUNK INTERFACE
157 657
ROUTER / WAN
185 / 180
585 / 580
SWITCH / CIRCUIT SWITCHED NETWORK
140 / 130
540 / 530

FIGURE 26

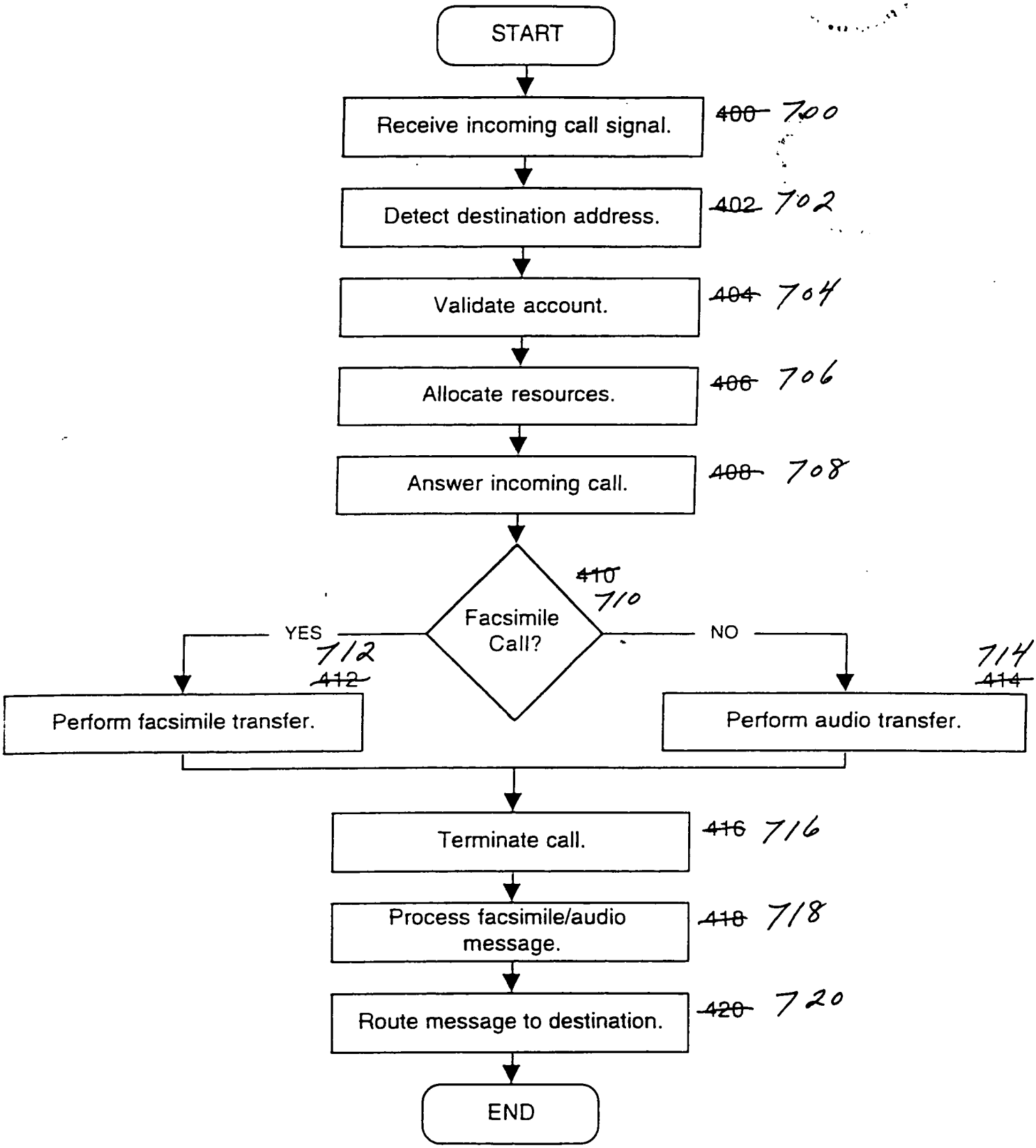
START
Receive incoming call signal.
400 700
Detect destination address.
402 702
Validate account.
404 704
Allocate resources.
406 706
Answer incoming call.
408 708
Facsimile Call?
410 710
YES
712 412
NO
714 414
Perform facsimile transfer.
Perform audio transfer.
Terminate call.
416 716
Process facsimile/audio message.
418 718
Route message to destination.
420 720
END

Figure 3 7